4104013001-00022-00
Date: 03/26/2004

HMI Soft-panel Design Specification for the Generation-3 Personnel Safety System (PSS) of the Advanced Photon Source at Argonne National Laboratory 9700 Cass Avenue Argonne, Illinois 60439

WBS x.1.4.1.4.30.1

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NOTIFICATION OF SPECIFICATION REVISIONS

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1. Introduction

1.1 Purpose

This Software Design Specification presents the requirements to be use to develop the software for the Personnel Safety System (PSS). This concept is to be use by the programmer to develop the code for the HMI Soft-panel User Interface.

1.2 Definitions, acronyms, and abbreviations

The following are some of the frequently appearing or unique acronyms used in this document.

Down Stream: The direction defined by the path from the Storage Ring to the end of the last Station of a beam line. The beam flow is from the Storage Ring through the Front End Shutters into and through Station A and then to Station B and so on until the beam encounters either a closed Shutter or a beam stop at the end of the last Station.

Up Stream: The direction defined by the path from the end of last Station of a beam line to the Storage Ring.

Beam Active: Based on shutter position the system can determine if there is Active Beam in a Station.
Ex-1: If the Front End Shutters are closed, No Station can be Beam Active.
Ex-2: If the Front End Shutters are open then Station-A is Beam Active.
Ex-3: If the Front End Shutters are open and the downstream shutters are open, then Station-A is Beam Active and the down stream Stations are Beam Active

ACIS	Accelerator Control and Interlock System
APS	Advanced Photon Source
ASD	Accelerator Systems Division
BLEPS	Beamline Equipment Protection System
C&C	Command and Control system
CPU	Central Processing Unit
DOE	Department of Energy
ES&H	Environment, Safety & Health Manual
EPICS	Experimental Physics and Industrial Control System
EPS	Equipment Protection System
ESD	Emergency Shut Down System
FES	Front End Shutters.
FEEPS	Front End Equipment Protection System
I/O	Input Output
PSS	Personnel Safety System
PLC(s)	Programmable Logic Controller(s)
SAD	Safety Assessment Document
SLAC	Stanford Linear Accelerator Center
SRS	Software Requirements Specification
TBD	To Be Defined/Decided
XFD	Experimental Facilities Division

1.3 Scope

This Software Design Specification is limited to the Generation-3 PSS Chain-C Command & Control System. For requirements specific to an individual Beamline, refer to the User Software Requirements Specification.

1.4 Revision Record

Revision	Dated	Comments
-00	03/26/04	Create Document

2. Applicable Documents

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein, and the contents of this specification, the contents of this specification shall supersede requirement.

2.1 Government Documents

- DOE ORDER 420.2, November 05,1998
- Accelerator Safety Implementation Guide for DOE O 420.2, Draft, May 1, 1999
- DOE ORDER 5480.25, November 03, 1992
- DOE GUIDANCE 5480.25, September 1, 1993

2.2 Non-Government Documents

- APS Safety Assessment Document(SAD), Rev 1, May 1998, Argonne National Laboratory, Argonne, IL
- Argonne National Laboratory Environment, Safety & Health Manual(ES&H), May 27, 1999
- SLAC Report 327, April 1988, Stanford Linear Accelerator Center, Menlo Park, CA
- NCRP Report No. 88, Issued 30 December 1986, National Council on Radiation Protection
- Document No. 1111-00001-00 APS Quality Assurance Plan, dated May 1990

2.3 APS Standard

- Software Coding Standards for the Personnel Safety System of the APS.

2.4 PSS Specifications

- System Requirements Specification for the Generation-3 PSS.
- Functional Description for the Generation-3 PSS.
- Beamline Requirement Document.
- Chain-C Software Design Specification for the Generation-3 PSS Beamlines.
- Chain-C Master Input/Output Listings for the Generation-3 PSS Beamlines.
- Chain-C Master Fault Listings for the beamline Generation-3 PSS Beamlines.

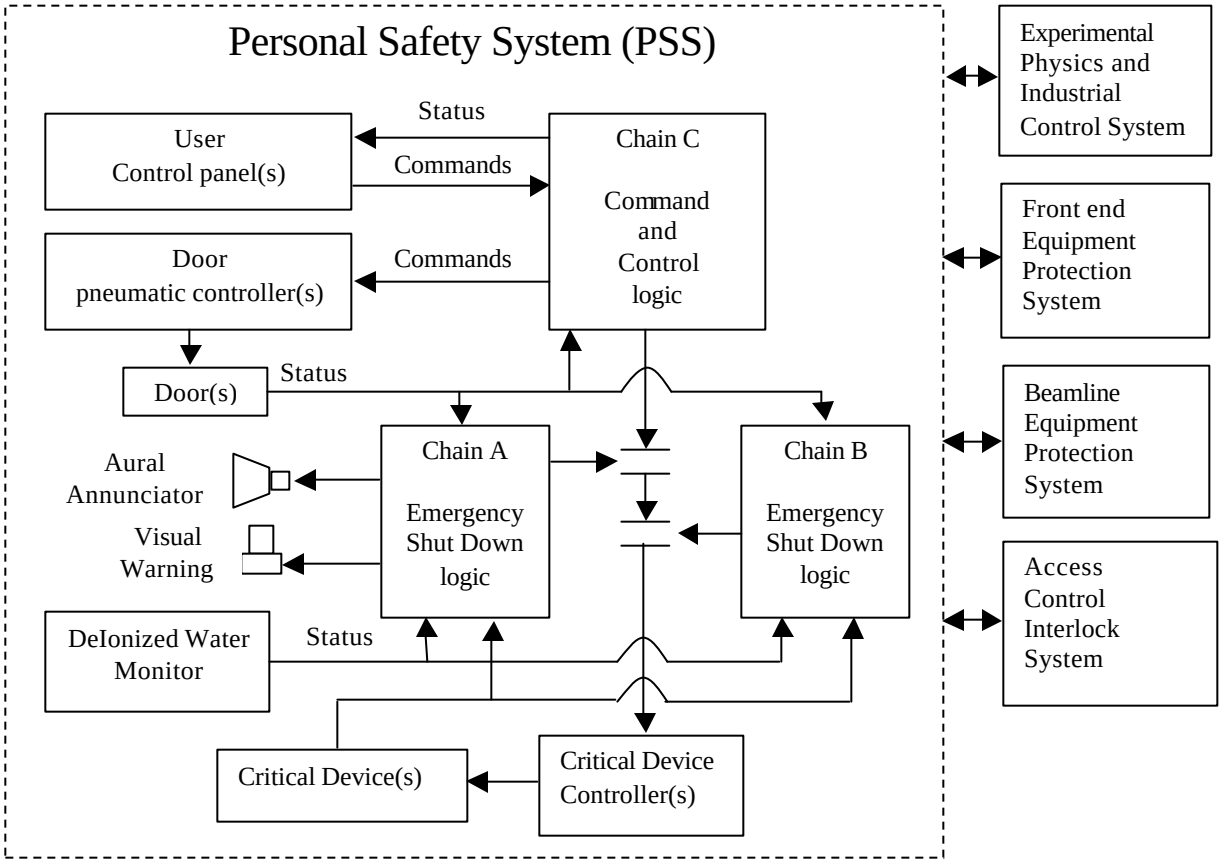
2.5 Other Publications

- Allen Bradley Control Logic PLC Programming Manuals
- Rockwell RSLogix5000 Programming Software Manuals

3. Operational Concepts

3.1 Overview

The PSS shall consist of two redundant Emergency Shut Down (ESD) subsystems and a separate command and Control (C&C) subsystem (see system constrains 2.5.1.2 & 2.5.1.3), which in turn interface with systems that control other aspects of the facility. The following block diagram shows the relationships between the major subsystems within PSS and its relationship to the other systems. The HMI will be used to for system status, control diagnostics and fault handling.



Hardware Interface Diagram

4. System Design Details

This section contains a narrative for the HMI Soft-panel User Interface.

4.1 Primary User Interface

This HMI Soft-panel is the primary User Interface for the PSS.
The HMI will interface directly with the Chain-C PLC only.
Its functions includes the following:

- Displaying system status information
- Displaying application and system faults
- Displaying diagnostic information
- Providing operational control for Users and Validators

4.2 Chain-A & Chain-B to Chain-C Communications

Chain-A & Chain-B will transmit specific configured signals to Chain-C.
These signals will be processed by Chain-C and displayed by the HMI.
These includes the following:

- Inputs / Outputs / Faults and Specific status information

5. HMI - General

This section describes the HMI functions and interfaces.

5.1 Displaying System Status Information

The HMI has the flexibility to display the status of any or every device in the system.

EX: ACIS GLOBAL ONLINE

- Green Status Indicator:
  This Indicator will be on when the Global On-Line signal is On.
- Red Status Indicator:
  This Indicator will be on when the Global On-Line signal is Off.

5.2 Displaying Application and System Faults

A corresponding indicator will show any Major Fault, Minor Fault or Warning on every screen. A detailed fault description can be viewed on the Alarm Screen.

- Major fault indicator - Generated by Chain-A / Chain-B
- Minor fault indicator - Generated by Chain-A / Chain-B / Chain-C
- Warning indicator - Generated by Chain-C

When the indicator is on (Green), there is no fault / warning active.
When the indicator is flashing (Red), there is a fault / warning active.

5.3 Displaying diagnostic information

Specific signal from all three Chains will be display by the HMI for trouble shooting and basic diagnostics. These screens can be generic or specific to each beamline.

5.4 Providing operational control for Users and Validators

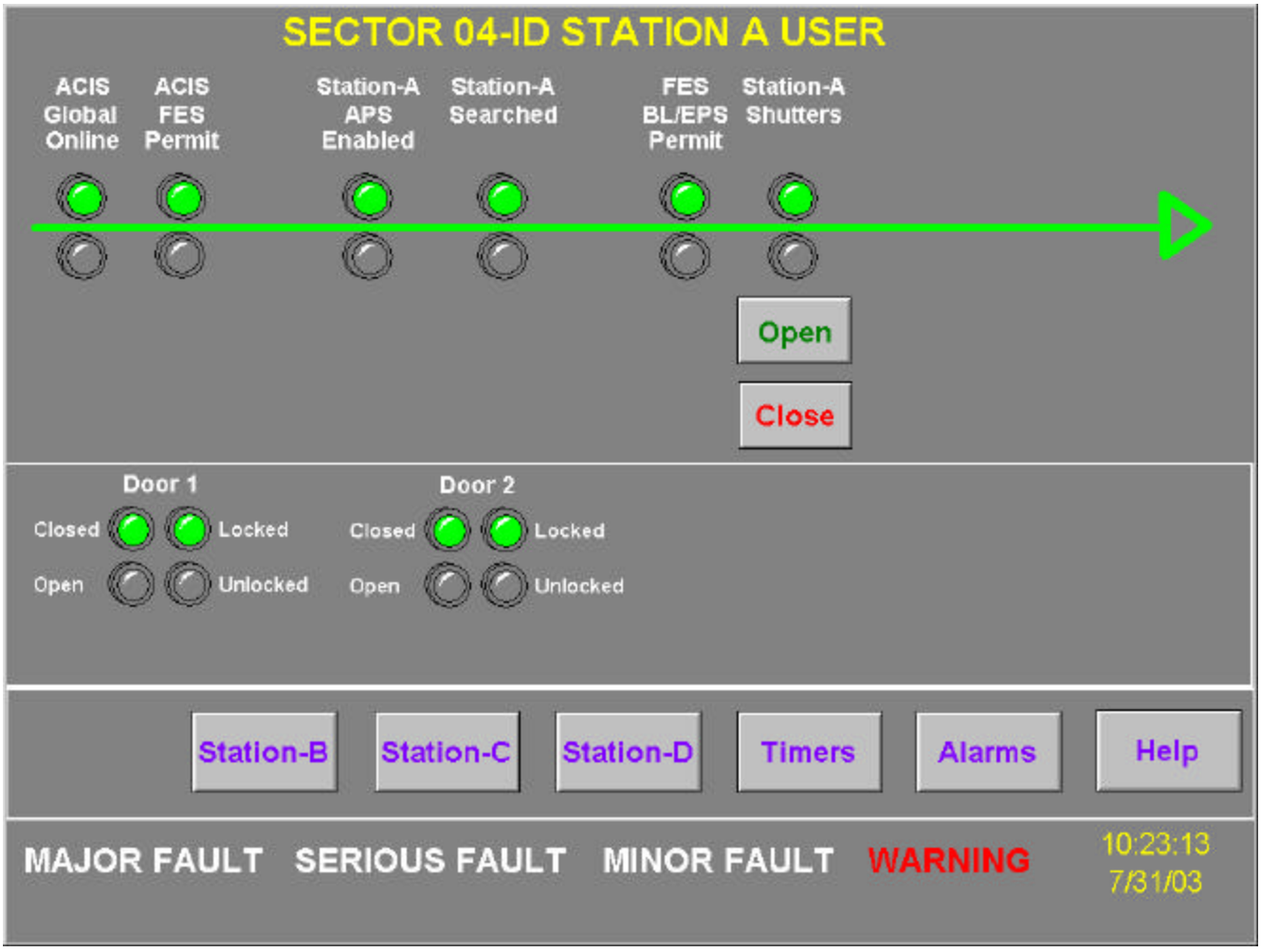
The HMI will be the primary interface for beamline operation.

- Shutter control
  - Normal Operation: each shutter cluster can be opened or closed
  - Validation: each shutter cylinder can be opened or closed
- Door control
  - All manual door locking / unlocking will be done by the HMI

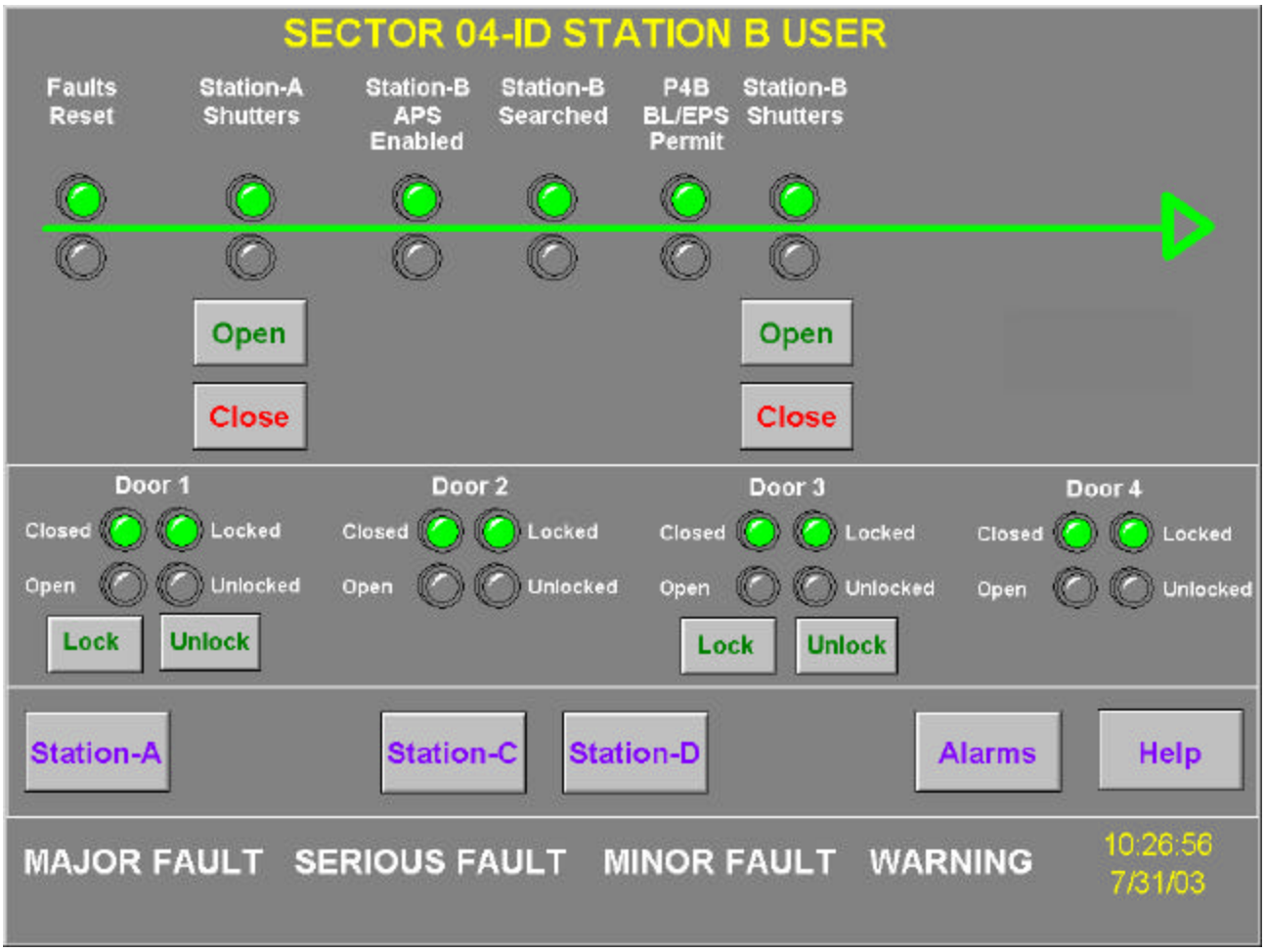
5.5 Screen layout and design

The HMI screen will be based on the existing 04-ID beamline.

PSS Control Panel Station A



PSS Control Panel Station B



6. Notes & Comments